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Execution Decision Model: Its the Process, Dummy!

by

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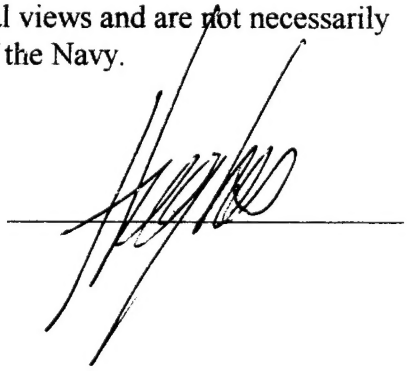
A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operation.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: 

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Execution Decision Model:

It's The Process, Dummy!

Abstract

This paper focuses on the impact of the revolution in military affairs (RMA) and the need for a decision model (process) for operational execution. The literature on operational art elements, functions, and principles discusses in detail the planning and preparation process of operations. However, written doctrine ignores Clausewitz's axiom that the plan is only valid until first contact. Research and this writer's empirical study indicate a requirement to facilitate the process for operational execution on the joint and combined battlefield. The decision model (process) for operational execution provides a tool to the operational commander to reduce the ambiguity of fog and friction of war, enhances command and control, and provides effective, efficient results without inhibiting agility, initiative, depth, synchronization, and versatility of military commanders.

"Strategy is the art of making use of time and space.[1]*" --Napoleon*

INTRODUCTION

The essence of prosecuting military operations at the operational level demands "rapid, informed, and correct decisions"[2] to achieve favorably decisive results. Decision making during the conduct of the operation requires the integration of time, space, purpose, and force (effects). Usually, the military force that incorporates momentum and tempo during execution, along with quick, accurate directions, achieves victory.

Napoleon recognized this phenomenon early in the nineteenth century. His solution revolutionized the organizational structure of military forces throughout the

world. He built the first combined arms formations capable of moving separately, using multiple avenues of approach, and concentrating at the decisive time and space to destroy the opposing force. This paradigm shift changed the conduct of war and, especially, the relationship of time, space, purpose, and force (effect).

Helmuth von Moltke furthered this idea of precision through another paradigm shift of organizing a general staff. Additional capabilities surfaced as a result of the industrial age. These include: weapons, trains, telegraph, and the like increased the complexity of war by extending its physical depth and breadth. This built the parameters for the real shift through the doctrinal development of an unprecedented planning process ensuring amazingly brief and decisive victories. Both Napoleon and Moltke recognized "strategic movements... upon decisive points... engage[d] at the proper times and energy"[3] yield a decisive victory. Both of these decision makers directed their forces during the operation ensuring that the elements of time, space, purpose, and force (effects) achieved the desired outcome. Both of these military decision makers imposed paradigm shifts to enhance their military capabilities and change the face of war.

Indeed, the most important observation we can gain from Napoleon, Moltke, and others like Billy Mitchell and Heinz Guiderian are the idea of paradigm shifts. Paradigm shifts are the way thinkers experience insights by seeing the "composite picture in another way."[4] The level of thinking required to view our environment in another way can deliberately or developmentally change the conditions under which we function and operate. The Revolution in Military Affairs (RMA) demands a review of our execution

of operational level of war (composite picture) and process decisions integrating time, space, purpose, and force (effects).

Today's operational art doctrine at the service component level and joint level focuses on planning. The literature on operational art elements, functions, and principles discusses in great detail the plan and preparation of operations but treats the conduct (or actual execution) very superficially. This doctrine, by placing a significant amount of weight on the importance of planning, ignores Clausewitz's axiom that the plan is only good until first contact.[5] Our joint doctrine's expectation is the plan, coupled with commander's intent, provides the centralization and licenses the subordinate commanders' execution authority by decentralization. However, absent from current doctrine is the means to synchronize real time, space, purpose, and force (effects) to the plan. Thus, synchronization of time, space, purpose, and force is at the mercy of subordinate commanders, fog and friction, and the enemy's decision cycle.

The intent of the decision model for operational execution is to provide a tool to the operational commander to reduce the ambiguity of fog and friction of war. Moreover, the model, as a tool, enhances the command and control and provides both effective and efficient results without inhibiting agility, initiative, depth, and flexibility of military commanders at all levels of operation. Integrating scientific modeling, such as critical path method, information queuing logic, and program evaluation and review techniques into the decision process creates an environment that assists in the anticipation of "windows of opportunity" or trouble spots so various actions and events

are coordinated. In effect, the model keeps the commander appraised of all critical requirements and considerations that bear on the consequence of operational level decisions.

Given the RMA and its impact on the tempo, lethality, and sustainability; the merging of all three levels of operations;[6] and the compression of the planning, preparing, and execution cycle, the need for an execution decision model is paramount in the prosecution of war in the twenty-first century. The US Army today is experimenting with different force structures in their battle labs and with the EXFOR (experimental force) at FT Hood, Texas. The experiments employ innovative command and control systems like Inter-Vehicle Information System (IVIS), Brigade and Battalion Command and Control Systems (B2C2), and All Source Analysis System (ASAS) that reduced division level planning from a twelve hour cycle to two hours.[7] Integration of these systems with Joint Surveillance Target Attack Radar Systems (JSTARS), unmanned aerial vehicles (UAVs), satellite imagery, Defense Mapping Agency (DMA) digital mapping capability, EPLARS, and other initiatives at the operational level emphasizes the importance of how quickly the transition from planning to execution will occur in the future. The magnitude and duration of operational execution will exceed all known tempo cycles we currently know and understand. This, coupled with the proliferation of information and the ability to "see" the battlespace, only increases the need and importance of a decision tool for the commander to reduce risk and to increase effectiveness and efficiency for the operational success.

"Fighting is the central military act; all other activities merely support it. Its nature consequently needs close examination[8]." –Carl von Clausewitz

OUR DOCTRINE

Operational level decision makers plan and execute campaigns. Campaigns are a series of tactical engagements, major operations, or battles usually involving air, ground, and sea forces. The arrangement of these forces in time, space, and purpose that link tactical and the strategic levels of war are campaigns. The campaign plan constructs the arrangement of the various forces to achieve the strategic aims. The cornerstone of the campaign design is synchronization of the air, land, and sea engagements.

The campaign plan is the way the operational level of war decision maker intends to employ his operational operating systems (OOS) to attain the desired end state. The series of tactical engagements, battles, and major operations become the concept of the operation in achieving the operational objectives and strategic aims. Building the plan involves a very intricate process outlined in Joint Pubs 3-0 (Doctrine for Joint Operations) and 5-0 (Doctrine for Planning Joint Operations). The five phased deliberate planning process and six step concept development process standardize the methodology for designing campaign plans or major operations at the operational level of war. Inclusive in operational level of war engagements, battles, and major operations are military operations other than war (MOOTW). While campaign planning is the operational level commander's abstract of the conduct of the operation, the developed plan considers and analyzes a litany of conditions and circumstances within the battlespace environment. Although the plan considers environmental conditions and circumstances, development is isolated from true interaction with the adversary.

Once the plan is implemented interaction begins. The interaction of the two opposing forces surfaces the real conditions and circumstances of the campaign. Operational level decision makers, now faced with realities rather than the abstracts of the plan, must adjust the plan to reality. Our Joint Doctrine provides little insight or any deliberate process to adapt the plan.

Joint Pub 5-0, Doctrine for Planning Joint Operations devotes the majority of its discussion and attention to planning. The title of Chapter III, "Joint Operation Planning and Execution" suggests operational level execution is addressed. However, upon inspection the entire chapter dedicates its discussion to Joint Operation Planning and Execution System (JOPES), Deliberate Planning Process, and Crisis Action Planning. None of the discussions provide insight on how to execute operational level missions.

Chapter II, Joint Pub 3-0, Doctrine for Joint Operations, states:

> "Command and control is the exercise of authority and *direction*... in the accomplishment of a mission... [furthermore] JFCs influence outcome of campaigns and major operations by [1] *assigning* missions, [2] *designating* priority of effort(s), [3] *prioritizing and allocating* resources, [4] assessing risks to be taken, [5] *deciding* when and how to make adjustments, [6] *committing* reserves, [7] staying attuned to the needs of subordinates and seniors, [and 8] guiding and motivating the organization toward the desired end state." [9]

Joint Doctrine identifies the elements of command and control as: direction, deciding, committing, prioritizing and allocating. However, the missing element is the process or model that bridges the plan to reality during execution. The most important decisions commanders at any level make hinge on when and where to apply forces or combat effects in *real* time, *real* space, and *real* purpose. Yet, Joint Doctrine provides no

techniques, procedures, models, or processes to ensure synchronization and synergistic effects to the battlespace.

The fall of the Berlin Wall increased intervention type missions and Goldwater-Nichols changed the old single service component operations of the cold war period to joint and combined operations. The linchpin of joint and combined operations is synchronization. Grenada, Operation Just Cause, joint and combined exercises, and simulations demonstrate the critical role synchronization plays during execution. Joint decision makers and their staffs need guidance and a process to link operational operating systems to time, space, and purpose during the prosecution of the campaign[10].

According to Colonel (USA) Pat Lamar, Director of the Battle Command Battle Lab at FT Leavenworth, Kansas, there is a disconnect between planning and execution. "Based on our observations, major disconnects occur because of a lack of understanding of synchronization."[11] Major disconnects in synchronizing time, space, purpose, and force during the execution of an operation suggests a need for a process. Paramount in a decision model for execution is the means to synchronize the campaign.

Naval Doctrine Publication 6, Naval Command and Control, suggests command and control is the "process that translates idea [plan] into action [decision making during]." Furthermore, NDP 6 identifies the "the decision and execution cycle" as continuous and cyclical process. The doctrinal navy process is four sequential phases known as the "OODA Loop" (observe, orient, decide, act). Appendix 1 graphically depicts the OODA Loop. [12]

Using sensors and other information collection nodes the commander *observes* the environment. This provides commander with information about status for both the

friendly and enemy forces. This information builds a common battlespace picture shared by commanders at all levels of war. By o*rienting* on the common battlespace picture, a conversion of the picture occurs and provides the commander with an estimate of the situation and understanding current conditions. The orientation the commander derives from an understanding of the battlespace or situational awareness *decides* a course of action.[13]

Regarding the adversary, tempo is essential to success during the decision and execution. Tempo is the speed relationship of our decision and execution cycle relative to the opposing force's cycle. In other words, the more rapidly we decide and execute in relation to the enemy, the more we limit the enemy's choices. At the operational level of war executing sequels and branches, transitioning of phases, and synchronizing forces at operational decisive points underpins the enemy's ability to act. This achieves dominant tempo within the battlespace gaining a decided military advantage. Rapid tempo must include meaningful accurate decisions. Although NDP 6 provides some insight and conceptual steps for decision making during execution, a methodology linking the plan to reality remains absent. Moreover, the OODA Loop does not adequately integrate time, space, purpose, and force into its methodology. The two important elements identified in the OODA Loop—tempo and information—provides essential pillars in a viable decision process.

The Army exercises similar concepts and procedures in approaching the decision process. The doctrine in FM 100-5, Operations expands the OODA Loop concept to include "the arrangement of battlefield activities in time, space, and purpose to produce the maximum relative combat power at the decisive point." [14] Decisive point adds an

additional pillar to the decision process during execution. Joint Doctrine indicates that decision points are products of intelligence preparation of the battlespace (IPB). IPB is part of the planning process necessary to conduct the commander's estimate. Thus, the first doctrinal link connecting the plan to execution is decisive points. Decisive points assist in connecting time, space, and forces to concentrate effects on the battlefield. The result causes a consequence to the enemy's operation.

Additionally, the Army established a means to display the plan with time, space, force, and purpose. The synchronization matrix (Appendix 2) provides the commander, staff, and subordinate commanders a visualization of the plan. It uses time as the medium to convey execution and aids the commander in the synchronization process of time, space, purpose, and force (effects). Like the OODA Loop, the synchronization matrix is incomplete. The matrix captures the plan and both the friendly and enemy courses of action (COAs) overlaid on the projected time. The matrix does not capitalize on the OODA Loops power of observing and orienting information collection for direction at decisive points during execution. Considering the observations and comments by Colonel Lamar, the issue of linking the plan to execution remains. The review of both the Navy and Army doctrine provides some insight into a decision process during execution. However, the service components' doctrine is incomplete, too. A decision model for execution fills a critical void at the operational level of war.

"I have spent over half of my life wondering what is on the other side of the hill[15] *–Duke of Wellington*

THE REVOLUTION IN MILITARY AFFAIRS (RMA)

Our military environment is undergoing a revolution from "brute force" to one of "brain force." This revolution cuts across the entire military spectrum and includes all levels of war. "RMA combines new technologies into military systems to dramatically increases the effectiveness of the armed forces."[16] From Admiral Owens' "System Of Systems," the Air Force's Theater Missile Defense (TMD), and the Army's Force XXI, each service component is feverishly capitalizing on RMA.

The ability to collect, process, disseminate, and *use accurate* information with unprecedented speed changes command and control as we know it. How the services leverage and implement information power determines success or encourages failure. The Prussians, failing to recognize the changing nature of war at Jena-Auerstadt, met defeat at the hands Napoleon. The French defeat in 1940 provides, yet, another example of not recognizing and leveraging technology in doctrinal concepts.[17]

Information technology expands the battlespace as a force multiplier through real shared situational awareness. The Army recognized the impact of an information rich environment and renamed the command and control operating system to battle command.[18] Desert Storm provided a glimmer of this powerful battlespace enabler. The manner of sensing, transmitting, processing, and assimilating thousands of bits of information provides the commander with enhanced abilities to assess and visualize the operational battlespace. RMA provides the basis for battlespace dominance with less effort and greater positive results. Understanding the volume, speed, and value information provides acts as a power catalyst to a command and control enabler. Leveraging computer technology places tremendous pressure on decision making tasks of deciding, directing, and controlling.

Paradoxically, the information rich environment also is the nemesis of the operational operating system--command and control. Embedded in RMA is the potential for chaos. Consider the magnitude of 700,000 phone calls and 152,000 radio messages per day required to coordinate and execute Desert Storm. In the future, imagine the amount of information generated by RMA and the demand for perfect situational awareness. The proliferation of systems, nodes, fusion, and dissemination centers challenges the time sensitive retrieval process.

"Command and control requires...a routine decision cycle.[19]*" –General Crosbie E. Saint*

THE FRAMEWORK FOR THE MODEL

Decision making during execution requires a logical means. Applying a process to the logic builds order for a sound decision. Without logic and a process to structure the decision, information becomes chaotic, and results in costly and disastrous decisions. Information and the production of that information are crucial to the decision. Therein lies the basis of the process. With the addition of the key pillars of tempo and synchronization to the basic architectural framework, the process begins to unfold.

Furthermore, missing from the initial framework is a medium to connect the pillars. The easiest and simplest medium is time itself. First, time is the common factor in planning operations. For example, planners consider the time needed to accomplish a task for both interactive forces (friendly and enemy). Secondly, time is the essence of tempo. Furthermore, time is the method used to synchronize the planned activities. Finally, time is the common thread for all three levels of war. Therefore, time is the medium chosen for this model.

By reviewing the planning process some key products easily integrate into and help bridge the gap between planning and execution. Intelligence Preparation of the Battlespace (IPB) produces crucial enemy timing elements called enemy decision points (EDP). EDPs are geographical points where the enemy force has tactical and operational COA selection options. EDPs define intentions and aid friendly forces in achieving tempo. Operational decisive points (ODP) provide the next product from the planning process. ODPs result from COAs development and wargaming. ODPs identify potential points in the battlespace to initiate a branch or sequel, concentrate component elements simultaneously, or initiate or stop an operational operating system activity. ODPs are not a doctrinal term but decisive points are. The idea is relative to decisive points but with an added condition. Specifically, the condition requires a decision at the operational level involving time, space, purpose, and force. Selecting ODPs defines the command relationship between the operational commander and subordinates. Additionally, ODPs identify decision points in the battlespace during execution reserved only for the operational commander. The establishment of ODPs eliminates the confusion of a centralized order executed decentralized guided by the vision in the commander's intent. Finally, EDPs and ODPs are important because each relates to a defined interaction. This provides a link to real time contact versus planned contact.

Overlaying the OODA Loop on the EDPs and ODPs narrows the focus of critical information requirements (CIR). Adapting the intelligence community's concept of priority intelligence requirements (PIR) tags each EDP with the critical information required to identify enemy intent and assists the commander in developing situational awareness. Appendix 3 depicts an EDP and generic PIR. In reality, each defined EDP

requires a specific PIR. ODPs function in a similar fashion. Each ODP has a specific purpose tied to the plan and involves time, space, and force at the operational level. By tagging friendly force information requirements (FFIR) to ODPs and coupling that with the related EDPs a logic process begins to take hold. Appendix 3 also depicts an ODP and generic FFIR.

The next step requires the integration of time. EDP and ODP information requirements already incorporate the planned time to implement enemy COAs and friendly branches and sequels. The commander now must determine the time needed to make decisions at each ODP. This translates to a requirement factor of when the commander needs the information to make the decision. Identifying these times and applying the program evaluation and review technique (PERT) method reduces bottlenecks, delays, and chaos through the identification of critical activities related to time and synchronization. PERT raises warning flags identifying favorable and unfavorable developments affecting execution decisions before they occur. In military terms favorable or unfavorable conditions equate to tempo and execution of planned branches or sequels. By default, identifying critical spots reduces the proverbial "fog and friction" of war. Furthermore, under unfavorable conditions PERT provides the proactive opportunity to develop other options rather than reacting to the enemy's tempo. From this standpoint, PERT acts as a valuable tool during execution by connecting the plan and reality to the decision.[20]

The products produced from PERT methodology are time factors. Two time factors are critical to the commander. The first one identifies the difference in his time to implement, synchronize, and execute a friendly COA in contrast to a related enemy

COA. When the friendly time factor is less than the enemy time factor, the decision favors execution. When the time factor is greater than the enemy's time factor, or both time factors are close together, the risk analysis indicates implementing an appropriate branch or sequel decision. The second time factor gleaned from PERT are w*indows of opportunity*. PERT/CPM methodology defines slack time (or lack of) in an operation. Slack time includes the time some resources wait idly for parallel, simultaneous, or sequential activities to finish. In a military sense consider parallel, simultaneous, or sequential activities include either component services or operational operating systems executing mission tasks. Key to recognizing slack time are the identified resources available to capitalize on actions directly related to tempo. The slack time factor provides the operational commander with a tool to exploit tempo with resources. By comparing friendly time factors to enemy time factors and applying available resources identified by the slack time factor, tempo increases. Granted this decision can not occur automatically. The information, however, cues the commander for potential opportunities. The commander reviews the operational environment within its totality and weighs the impacts. This provides the commander with the tools to logically make the decision links reality to the plan.

During execution real times replace projected ones. Regression analysis by processing actual times as part of the coefficient factors refines or calculates future times. This increases the accuracy of the projected time factors (for both the friendly and enemy), provides a truer picture, and enhancing tempo opportunities.[21] Accurate future time predictions enable the operational warrior to more confidently implement decisions

affecting the future. Appendix 4 provides a visual schematic of a portion of a generic campaign plan implementing PERT.

Perhaps an easier method to visual time as the medium is "time—information differential" concept.[22] This concept identifies *Ta* as the time it takes to act and achieve positions of advantage over the enemy in the accomplishment of a task. *Ti* represents the amount of time the element has to act. When the solution to the equation *Ti* - *Ta* is positive battlespace dominance is possible. When the solution is negative then the current plan will not achieve battlespace dominance; therefore, alternative actions are in order. The bottom line is information and time relates to decisions during execution to shape the battlespace for success. The advantage of PERT is the identification of *windows of opportunity* to cue the commander; not available in the time differential model. Therefore, PERT is the method used for this decision process.

The time sensitivity of information and RMA initiatives create a lethal environment for information overload. The process described alleviates some of that problem by prioritizing the need of information related to ODPs and EDPs. This organizes the order of the information flow by limiting it to a specific timetable relative to the interaction occurring in the battlespace. Additionally, during the analysis of the information requirements, the staff identifies appropriate data points that, in sum, produces the requested information. These data points establish the arrival and rate of service requirements needed to collect and analyze the data. Applying queuing theory to the arrival and service rates of data defines specifically a blueprint for the command, control, communications, computer, and intelligence (C4I) architecture is defined specifically for this operation. By considering both redundancy requirements and peak

information payload periods the C4I blueprint further reduces the potential for information gridlock. Finally, the defined information flow establishes control over the collection, storage, and retrieval of information as it relates to real time. Control begins to form over the operation as a result of the execution decision process.

Inherent in this execution decision model are control measures to assist in defining the *control* portion of command and control. The identification of information requirements establishes the staff's control and communication requirements of the operation. By establishing this common thread now, permits the staff and subordinate elements to clearly understand the functions of gathering, preparing, and presenting information to the commander. This acts as an enabler in the tracking, accounting, processing, requesting, and reporting information requirements so vital to control and execution.[23] Identification of operational decisions defines the control by which decisions remain at the operational command level and which are delegated.

Rapid movement of critical information to the commander is essential for execution. This requires a common understanding of plan to the reality of execution in terms of time, space, purpose, and force. The integration of information and associating that information with the ODPs connects live interaction of the battlespace to the plan. This enables operational synchronization to occur under the direction of the commander. Appendix 5 illustrates the execution decision model (process). Appendix 6 enhances the Army's synchronization matrix by adding elements of the OODA Loop in the form of EDPs, ODPs, and information requirements[24]. This is a method for cueing operational decisions and supervising execution at the operational level.

Conclusion

Warfare requires synchronization at every level. Planning synchronization is institutionalized in our joint doctrine through the assessment and commander's estimate process. The method of synchronization during execution is through subordinate elements in a decentralized manner. This has the potential of creating stovepipe operations preventing the natural integration of time, space, and purpose of joint force by either the component commanders or the operational operating systems. At best, this sets the stage for fragmented effort and effects in the operational battlespace, results in the inefficient use of resources, and risks the achievement of the strategic aim. The execution decision model overcomes this problem by defining the operational decision points and the information required to implement the decision. Achieving a common view of the battlefield by both the commander and the staff immensely enhances the agility and versatility of decision making during execution. The staff can pass critical information rapidly to the commander in a form that links the plan to actuality. RMA products enhance the speed and processing of data to knowledge for decision making, but without a focused intellectual effort no order imposed results in chaos. An undefined process consumes vital time, costing initiative and agility, and increases the incompetent decision. A defined process frees up commanders and staffs to focus energies on achieving success. After all, operational victory is our ultimate goal why not institutionalize the execution process.

ENDNOTES

[1] Chandler, David G., Campaigns of Napoleon, New York, The MacMillian Company, 1966, p. 67.
[2] Becker, Patrick J., What is Adequate Decision Support System for the Operational Level of War?, FT Leavenworth, Kansas, School of Advanced Military Studies, United States Army Command and General Staff College, June 1990, p. 5.
[3] Baron De Jomini, The Art of War, reprint, translated by G.H. Mendell and W.P. Craighill, 1862, Westport, Connecticut, Greenwood Press, 1973, p. 63.
[4] Covey, Stephen R., The 7 Habits of Highly Effective People, New York, Simon & Schuster, 1989, p. 28.
[5] Clausewitz, Carl, On War, New Jersey, Princeton University Press (edited and translated by Michael Howard and Peter Paret), 1984 edition, p.
[6] MacGregor, Douglas A., "Future Battle: The Merging Levels of War," Parameters, Vol.XXII, No.4, Winter 1992-93. LTC MacGregor suggests the technologically altered battlefield dimensions of time and space compress the three levels of war into a single new structure for integration of complex air-land-sea combat operations. His analysis points out that 21st Century capabilities immediately convert tactical success on the battlefield into decisive strategic results. "Force XXI: Land Combat in the 21st Century," US Army Training and Doctrine Command Pamphlet, endorsed by General William W. Hartzog, leads the reader to the same conclusion. The pamphlet highlights "initial glimmerings that battle is changing" and the composite view is changing to revolutionize land combat. Characteristics of future operations include distributed operations, simultaneity, shape the battlespace, and decisive operations. Absent from the discussion are sequels, branches, linear and contiguous all terms identified as part of current "operational art." The power of Force XXI will achieve immediate decisive victory. Implied in the pamphlet are the same lethality and end state achieved during Napoleonic and Bismarkian campaigns quick, highly lethal, and decisive tactically and strategically simultaneously.
[7] Edwards, Roy (COL, USA), Interviews with Colonel Edwards in April/May 1996 identified eliminating 10 of the 12 hours consistently by MG Coffee's division staff with the new C4I structure provided by Force XXI initiatives. Colonel Eduwards a member of J6 this faster planning cycle will speed up the process at the Operational Level when augmented by JSTARS and similar C4I initiatives. Colonel Edwards thinks we expect a two fold phenomena occurring. First the merging of all three levels of war (strategic-operational-tactical). Secondly, an incredibly fast plan-preparation-execution cycle compressed as a result of integrated information system and shared knowledge.
[8] von Clausewitz, Carl, On War, p. 227.
[9] Joint Chiefs of Staff (JCS) Pub 3-0, Doctrine for Joint Operations, 1 February 1995, p. II-16. The italics are mine to emphasize that the doctrine expects decisions by commanders during execution.
[10] Haith, Michael E., CINC-ronization (Synchronization): The Critical Tenet in Future Operational Art, Kansas, School of Advanced Military Studies United States Army Command and General Staff, a monograph, 1989-90, p. 3.
[11] Lamar, Patrick, Colonel U.S. Army, Chief of Battle Command Battle Lab, FT Leavenworth, Kansas. I sent an email messages (April and May 1996) inquiring on why disconnects occur between the plan and execution. Specifically focusing on the reason units piecemeal operating systems during execution. Colonel Lamar returned my email inquiries with several short responses. He indicated units do not understand synchronization, lack training, and fail to develop adequate procedures ensuring synchronization. His battle lab collects and analyzes information related to command and control from the battalion all the way through corps level exercises. These C2 elements include the tactical to the beginning of operational level of war. Since the decision makers and staff assigned at these levels have not adequately solved the disconnect one can easily conclude when they are assigned corps, JTFs, and CINC positions the problem still persists. Furthering the issue that guidance in the form of a useable process is required in Joint Doctrine.

[12] Department of the Navy, Naval Doctrine Publication 6, Naval Command and Control, Washington, DC, May 1995, pp. 17-18.
[13] Naval Doctrine Publication 6, Naval Command and Control, pp. 18-19.
[14] US Army, Field Manual 100-5, Operations, Washington, DC, 1993, pp. 18-19
[15] Glass, Robert R. and Davidson, Phillip B., Intelligence Is For Commanders, Pennsylvania, The Military Publishing Company, 1948, pp. 66-67.
[16] Krepinevich, Andrew F., "Cavalry to Computer: The Pattern of Military Revolutions," The National Interest, Fall 1994, p. 30.
[17] Gray, Colin S., "The Changing Nature of Warfare," *Naval War College Review*, Spring 1996, Vol. XLIX, No. 2, p. 19.
[18] US Army, FM 100-5, Operations, Washington, DC, 1996, p. 2-14.
[19] Saint, Crosbie E., "A CINC's View of Operational Art", *Military Review*, September 1990, p. 76.
[20] Thierauf, Robert J. and Grosse, Richard A., Decision Making Through Operations Research, New York, John Wiley & Sons, Inc., 1970, pp.114-128. The authors discuss a thorough application for decision making using PERT and CPM. The "slack time" produced from PERT/CPM methodology relates to different tasks within the process. The size of the slack time or lack of slack time provides decision makers with a tool to switch resources to either complete the project as planned or ahead of schedule. Using these scientific tools in identifying critical spots in the process has application to military operations. The key to applying these scientific tools is understanding the time factor. Time applies to our theory of tempo and PERT/CPM identify crucial periods in process develop through time. The expectation of the decision maker is to use the time factor products from PERT/CPM to identify "windows of opportunity". The size of the "window of opportunity" is time. Comparing friendly time factors to enemy time factors determines how big the "window of opportunity" is. This will no doubt assist the decision maker in determining whether the sequel or branch is appropriate. It will also help eliminate those that are not appropriate and cut off the collection effort for those. By doing this the staff's efficiency is increased by a factor of number of information or data points no longer requiring OODA Loop action.
[21] Hamburg, Morris, Statistical Analysis For Decision Making, New York, Harcourt Brace Javanovich, Inc., 1983, pp. 353-357. Regression and correlation analysis are used for prediction. When the military plans an operation time is predicted. With the advent of RMA the original prediction is easily converted to a prediction through regression analysis using off the shelf software and automation. The real times can be entered into the simple two variable linear regression model $\mu_{Y.X} = A + BX$. A and B are the parameters that must be estimated from the real data (time and space). Size and type of force and terrain (water, air) can be included in the calculation too. X becomes the conditional standard deviation of time predictions. Y becomes the new predicted times. Recognize the new predicted times assume a linear relationship and only relevant within that context. Correlation analysis evaluates the accuracy of the coefficient of the dependent and independent variables and their fit to the linear line.
[22] DeGroat, Arthur S. and Nilsen, David C., "Information and Combat Power on the Force XXI Battlefield," *Military Review*, LXXV, No. 6, November-December 1995, pp. 57-58.
[23] Burke, Charles M., "The 'Bondage' of Tradition," *Military Review*, Vol. LXXV, No. 4, July-August 1995, p. 11.
[24] Haith, Michael E., CINC-ronization (Synchronization): The Critical Tenant in Future Operational Art, p. 34. The sync matrix in appendix 6 is a combination of Haith's and my ideas. I added the ODPs, EDPs, CIR, to Haith's matrix. The left side of the matrix on Haith's is OOPs along with the service component's role in each OOS. This is an excellent idea because the operational commander does understand the relationship of OOS implementers but his primary focus remains operational and OOS fits that bill.

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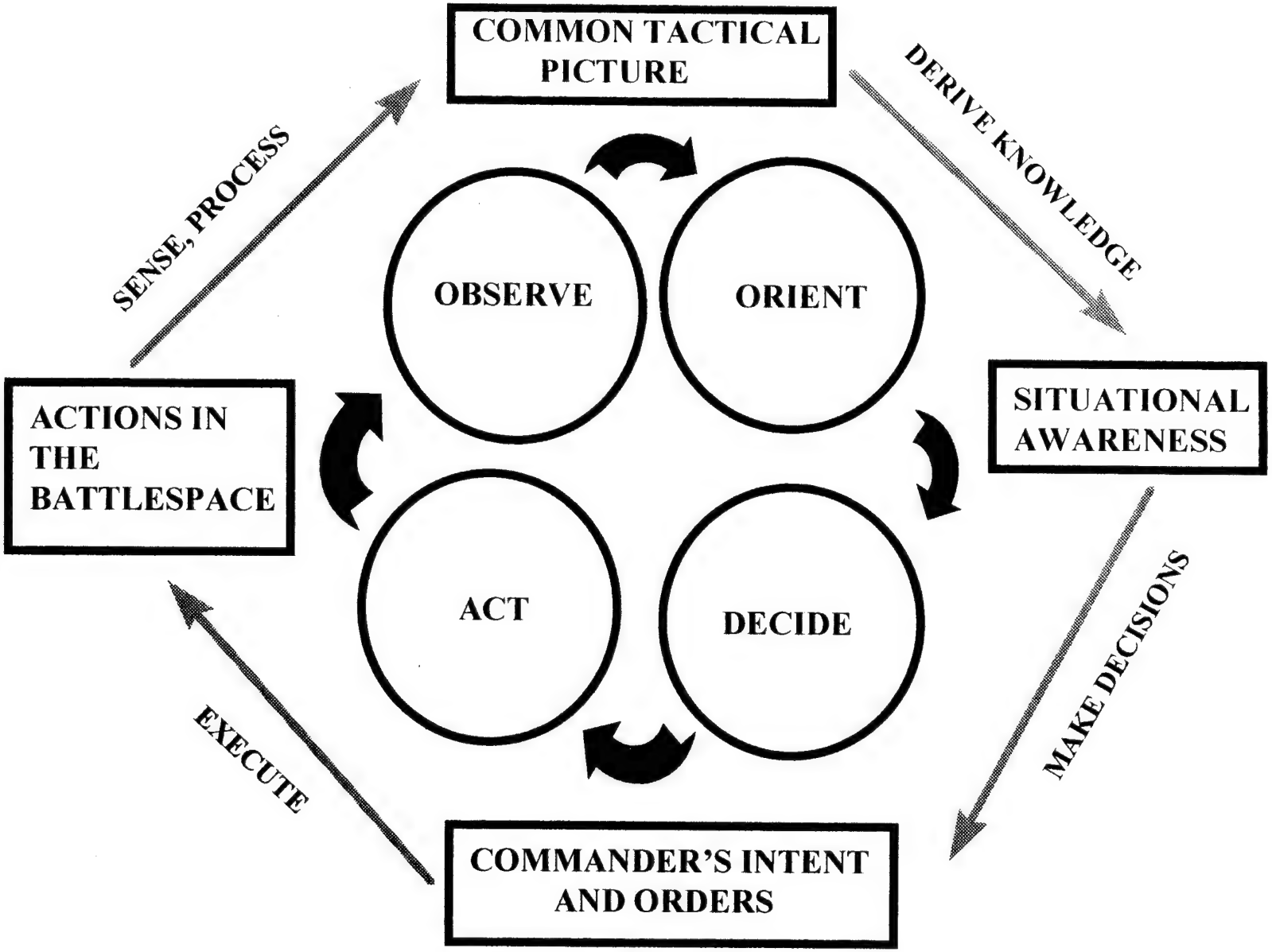
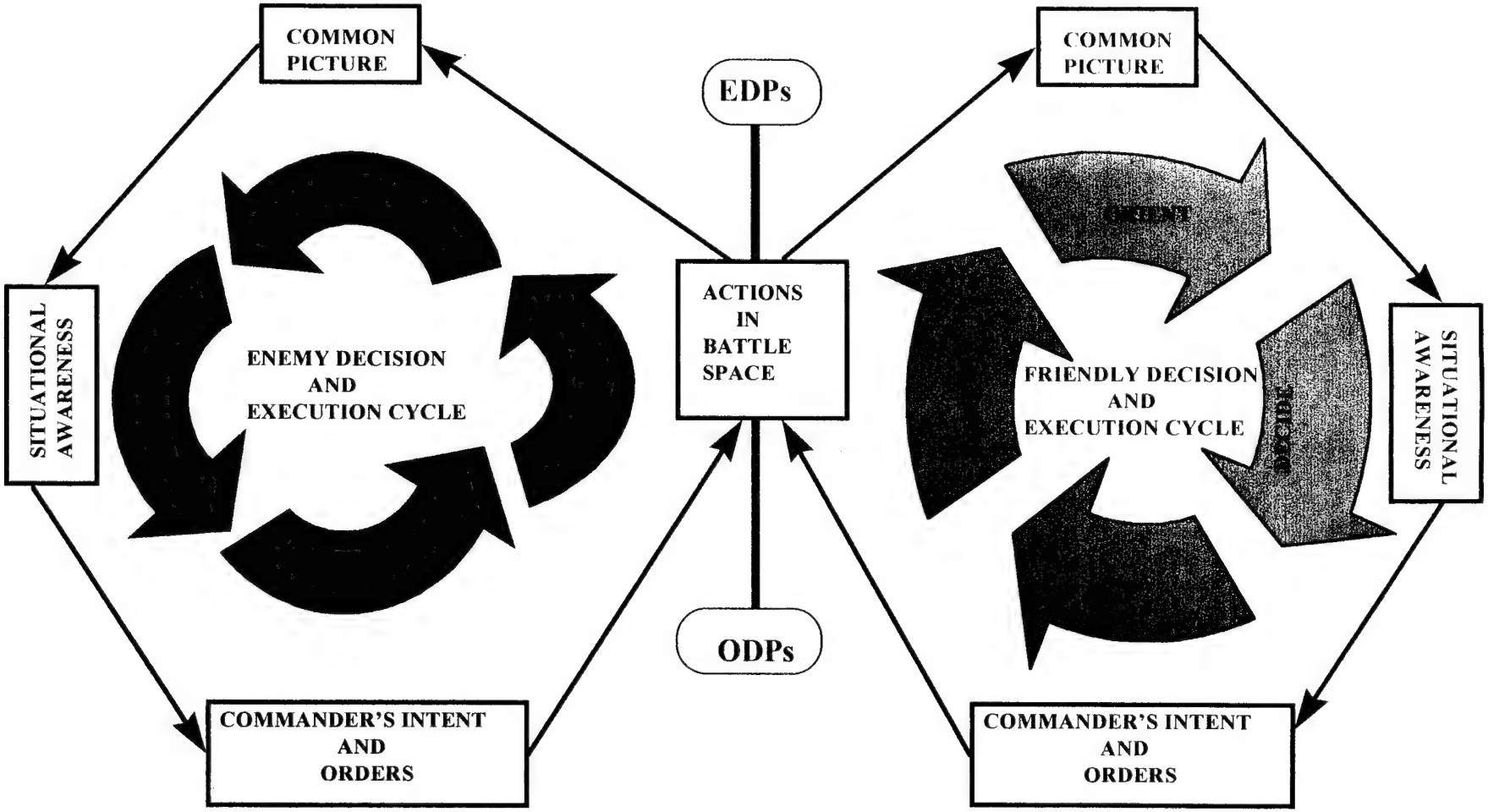


APPENDIX 1 THE "OODA LOOP"--THE DECISION AND EXECUTION CYCLE
SOURCE: NAVAL DOCTRINE PUBLICATION 6, PAGE 18

This illustrates the interaction of the enemy and friendly decision cycles. Tempo is achieved by one commander deciding and acting faster than the other. What is absent from this illustration is the time interaction as as it relates to the plan. PERT/CPM provide the integration element of both and display similar to a operational graphic. Without tangible cues the commandeer and staff inefficiently peruse data and information randomly with little regard to synchronization.



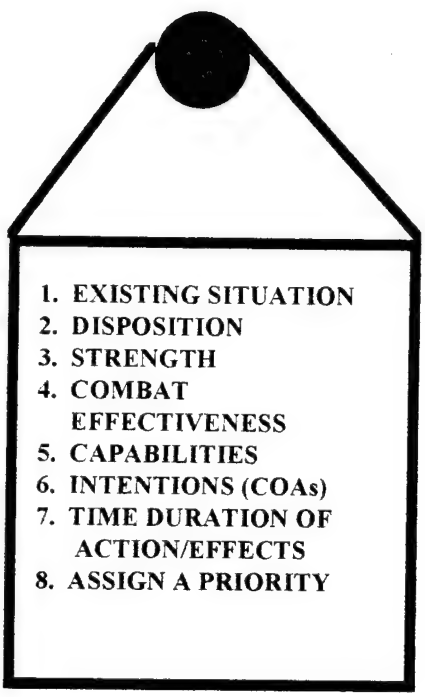
APPENDIX 1 INTERACTION OF FRIENDLY AND ENEMY DECISION AND EXECUTION CYCLE
SOURCE: NAVAL DOCTRINE PUBLICATION 6, PAGE 60

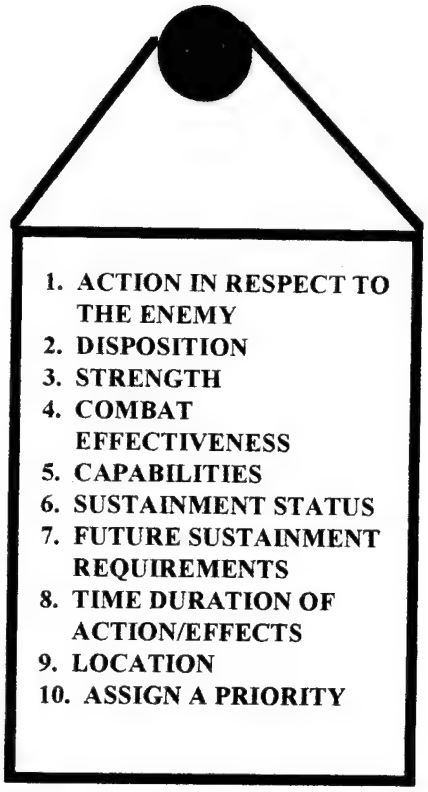
SYNCHRONIZATION MATRIX

TIME		H HR	H+1	H+2	H+8	H+24	D+2	D+2/H+	D+2/H+	D+2/H+	D+3	D+4
ENEMY ACTION												
DECISION POINTS												
MANEUVER	DEEP											
	SECURITY											
	CLOSE											
	RESERVE											
	REAR											
AIR DEFENSE												
FIRE SUPPORT												
MOBILITY/SURVIVABILITY												
COMBAT SERVICE SUPPORT												
COMMAND AND CONTROL												

APPENDIX 2. SYNCHRONIZATION MATRIX.
SOURCE: CGSC ST 100-9, THE COMMAND ESTIMATE, P. 45

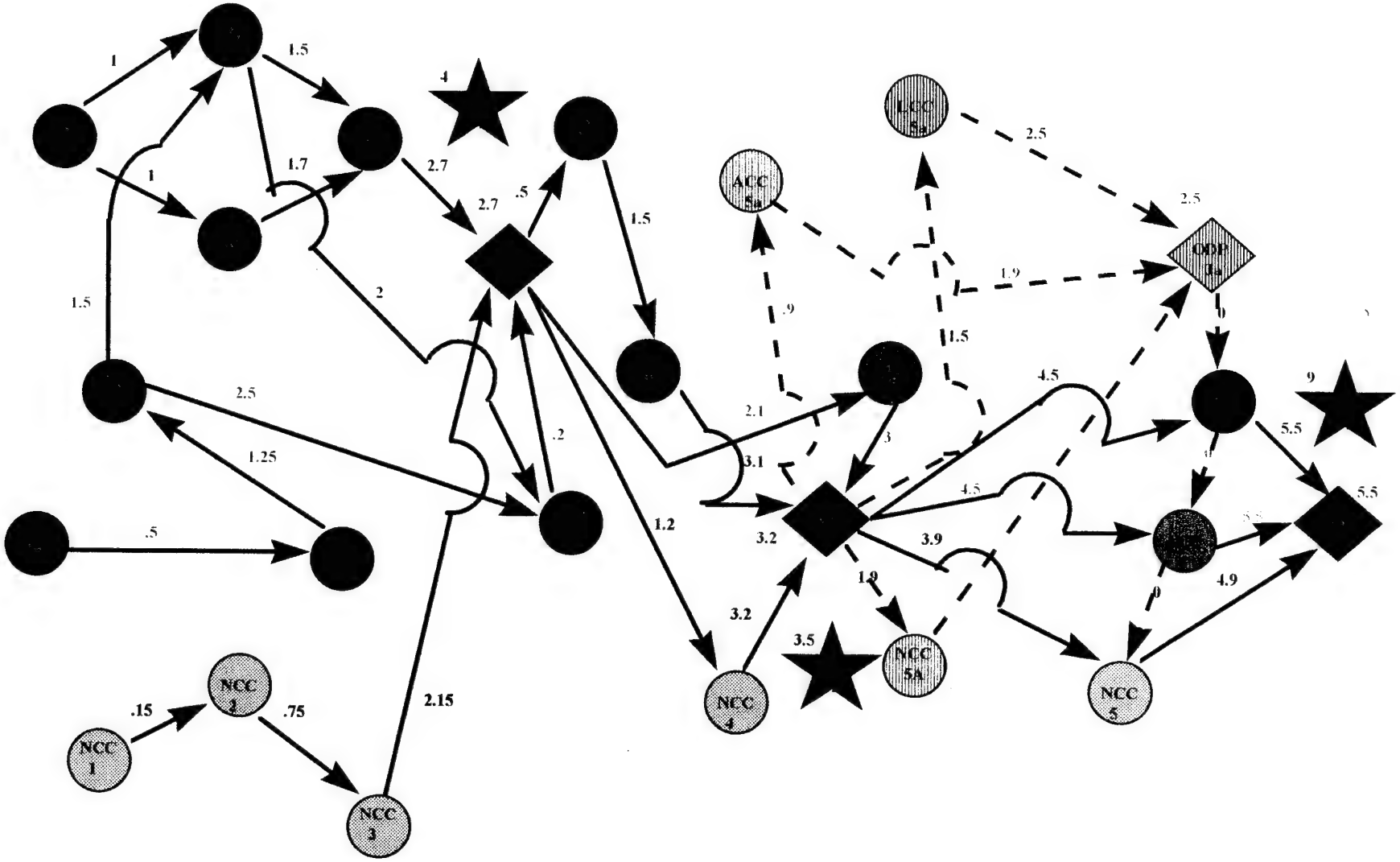
Appendix 3 EDP and ODP generic information requirements





NOTE: This is generic information requirements. The commander and his staff need to design the specific information requirements based *purpose* of ODP and EDP. Secondly, the staff must identify the data points which create operational information (knowledge). Information is not raw data. Information is data complied and analyzed for decision making.

PERT/CPM FLOW DEPICTNG FOR A PORTION OF A CAMPAIGN



LEGEND FOR THE PERT/CPM FLOW FOR A PORTION OF A CAMPAIGN

= THE LAND COMPONENT TASK AT THE OPERATIONAL-TACTICAL

= THE AIR COMPONENT TASK AT THE OPERATIONAL-TACTICAL

= THE NAVAL COMPONENT TASK AT THE OPERATIONAL-TACTICAL

= TIME TO CONDUCT OPERATIONAL-TACTICAL TASK COLOR DENOTES COMPONENT

= DENOTES BRANCH OR SEQUEL PATTERN STANDARD COLOR RELATED TO COMPONENT

= TIME TO CONDUCT OPERATIONAL COMPONENT BRANCH OR SEQUEL; COLOR RELATES TO COMPONENT

= ENEMY DECISION POINT; SHADED NUMBER REFLECTS TIME REQUIRED TO EXECUTE OPERATIONAL COA

= OPERATIONAL DECISION POINT REQUIRING SYNCHRONIZATION OF OOS OR COMPONENTS; SHADED NUMBER REFLECTS ACCUMULATIVE COMPONENT TIME TO ACCOMPLISH OPERATIONAL EXECUTION; A PATTERNED VERSION OF THIS SYMBOL REFLECTS POTENTIAL BRANCH OR SEQUEL.

APPENDIX 4 EXPLANATION OF PERT/CPM SCHEMATIC

The schematic on page 4-1 is a representation of a portion of a campaign or major operation at the operational level of war. The circles represent operational-tactical decisive points for component services. Depending on the scheme of the operation and design of the command and control these decisive points could represent the operational operating systems (intelligence, movement and maneuver, fires, protection, sustainment, and command and control). These decisive points are a result of the interaction of all members of the command during the commander's estimate of the situation process (CES). The purple diamonds of operational decisive points derived in the exactly same manner as the operational-tactical. The only difference is the OPDs have operational implications requiring command decisions from the operational level commander. These decisions include:

1. Synchronized air, land, or sea engagements which are conducted. simultaneously, sequentially, or both
2. Engagements conducted by more than one independent force or OOS or combination of the two.
3. the purpose of the ODP is to gain a cumulative effect on the enemy
4. ODP requires unity of direction in a coherent fashion as a result of a window of opportunity or potential loss of temp.[1]

The lines represent the development of the operation from decisive point to decisive point. The numbers on the lines (or to the right and color coded) represent the projected time to accomplish all the tasks necessary to achieve the purpose of the decisive point. The times accumulate from one decisive point to the next. In other the time factor to accomplish tasks land

component (LCC) decisive point 1 to land component (LCC) decisive point 2 is 1. The time to complete LCC2 to LCC3 is .5, the difference between the time from LCC1 to LCC2 less the time from LCC2 to LCC3. The cumulative time is important to the operational commander. The operational-tactical path which takes the longest time to the ODP is the time differential for the ODP. The other paths which have less time than the longest timed path are resources potentially available to exploit opportunity (especially tempo) that presents itself in the battlespace. This is the slack time. The time on the path includes all OOS implementation. Therefore the combat effectiveness of the resource is within the desired range to continue the current plan or execute a branch or sequel.

The cumulative time at each ODP is the factor the operational commander considers along with his critical information requirements (CIR) for that ODP in determining the decision--direction and action of the theater. The key proponents of the decision are *time*, friendly *force* information for the specified ODP (*space*) and the desired outcome at the ODP (*purpose*). Contrast this with the enemy time factor for feasibility. The stars represent the enemy decision points (EDPs) based on intelligence preparation (IMP) of the battlespace. The times for the enemy are projections based on experienced calculations of their capabilities and intent. RMA products provide simulations which can predict with some degree of accuracy times based on platform, geography and other factors like weather, visibility, etc.

If your time is greater than the enemy's time factor than your action is achievable. When the opposite is true the enemy has the decided advantage. Battlespace dominance is the goal. PERT provides the tools to visualize the scheme within the battlespace and assist in timing decisions. The operational warrior makes decisions for implementation in the future. PERT

[1] Dubik, James M., "A Guide To the study of operational art and campaign," FT Leavenworth, Kansas,

captures current operations and provides the vehicle to project time developments in the future. As stated in the basic paper, increasing the accuracy of PERT times is a matter of linear regression analysis. This way the PERT/CPM schematic is a living document constantly portraying future time projections based on current and past timed tasks in that specific theater. Correlation analysis refines the time factors and tells the reader how accurately the time factors are. This reduces the old fog and friction problem of time during past conflicts and enhances success opportunities.

Returning to the flow chart look at ODP 2 and EDP 2. Notice the time factors are very close to each other. This indicates some risk and warrants the development of alternative operational actions. The dotted line and pattern ODP and operational tactical decisive points represent a branch from the original plan. Now as the CIR and times unfold the operational commander can decide with certainty on which path to follow. Expanding and eliminating paths will continue throughout the operation. PERT facilitates logical transitions from phases, operations branches and sequels.

Finding windows of opportunity to gain the upper hand of tempo is hard. PERT captures these in two ways. First, presented on each path are the cumulative times. Comparing that information to the highest cumulative time for the ODP provides the decision maker with an available resource time factor. With CIR on other ODPs accumulating and EDP time factors constantly being updated the decision maker visualizes the interactive of the battlespace. Comparing the available resource time factors with other environmental input; opportunities appear. The operational commander sees the favorable battlespace situation and acts with new

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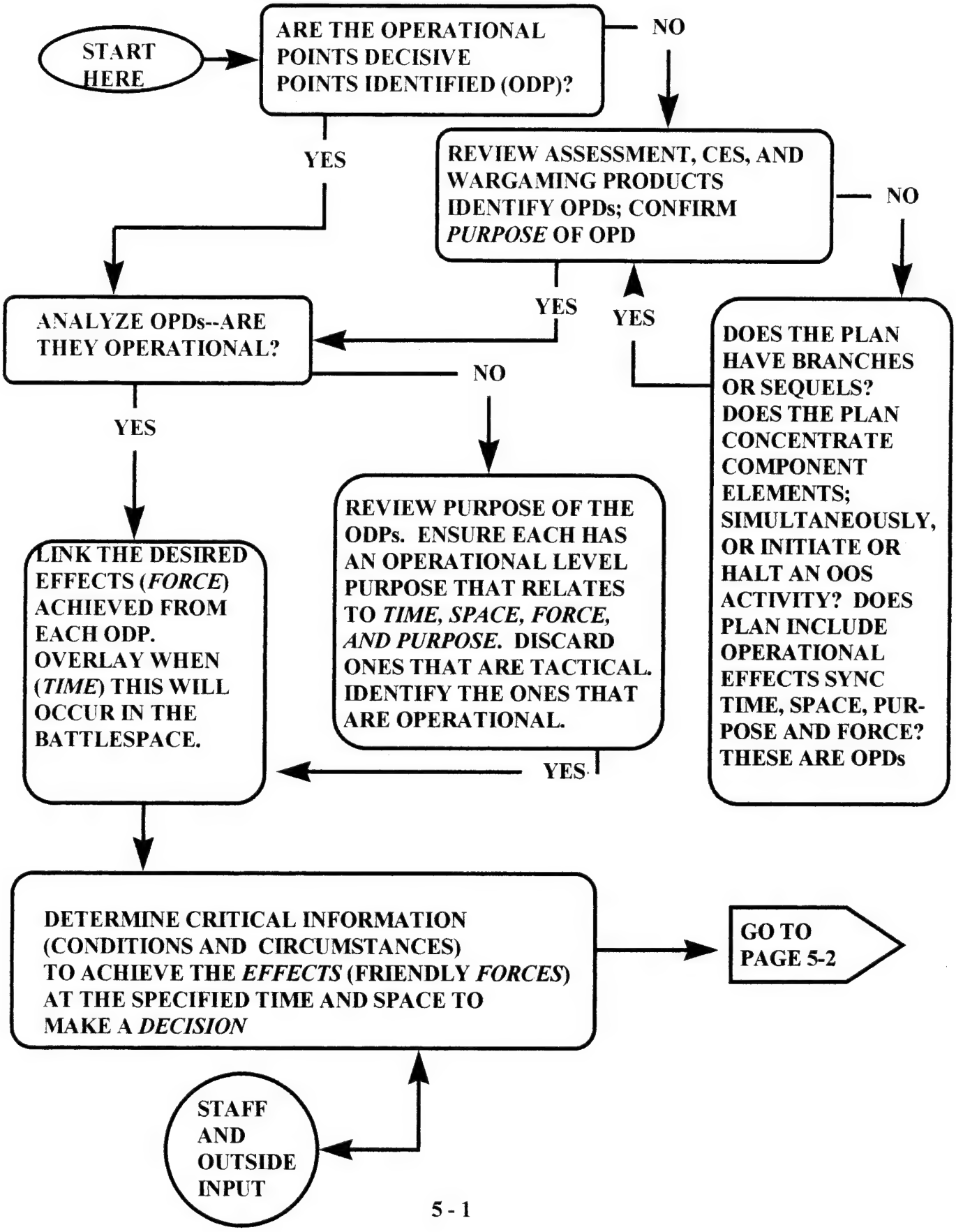
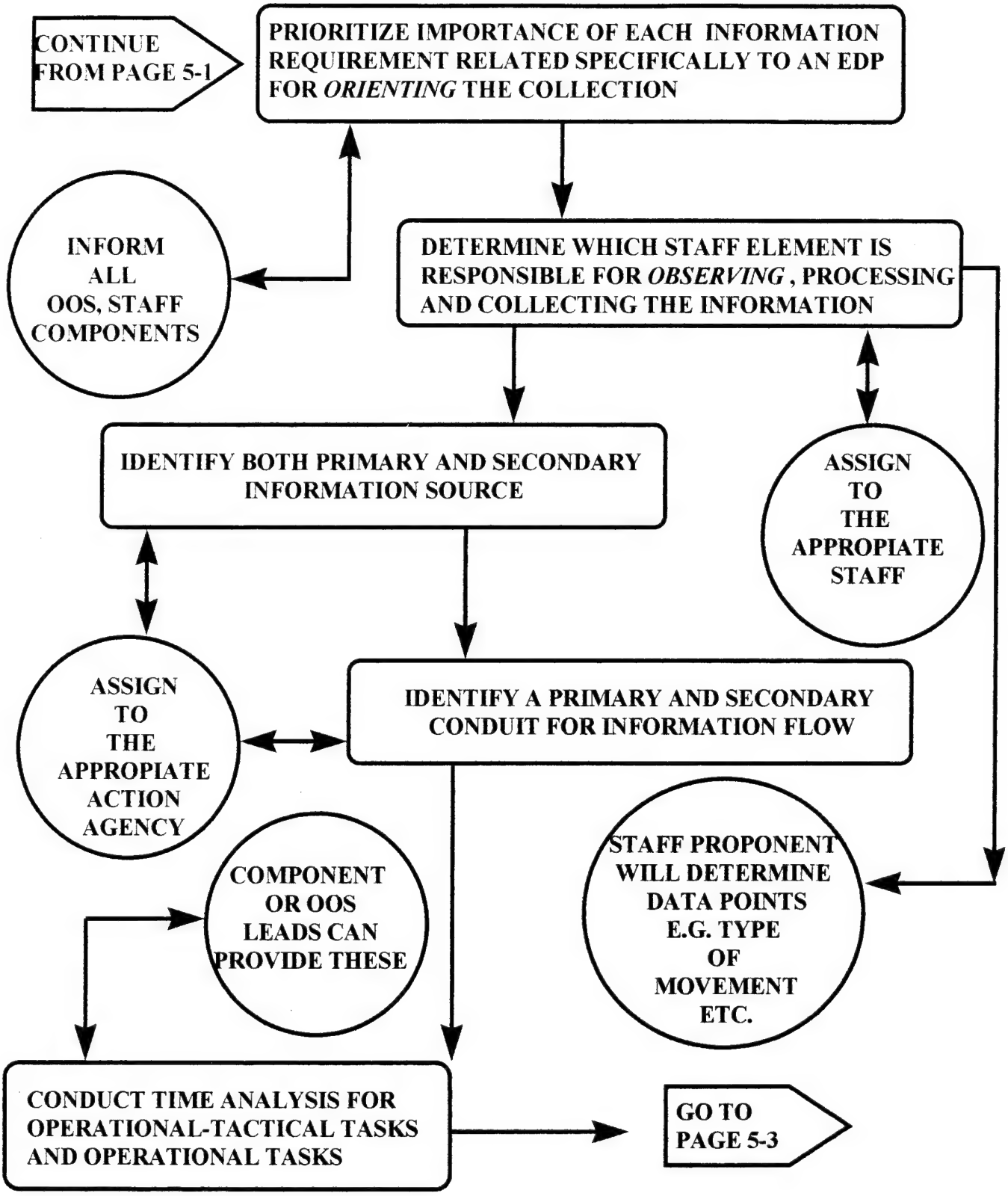
unpublished handout for School of Advanced Military Studies Program, 1991.

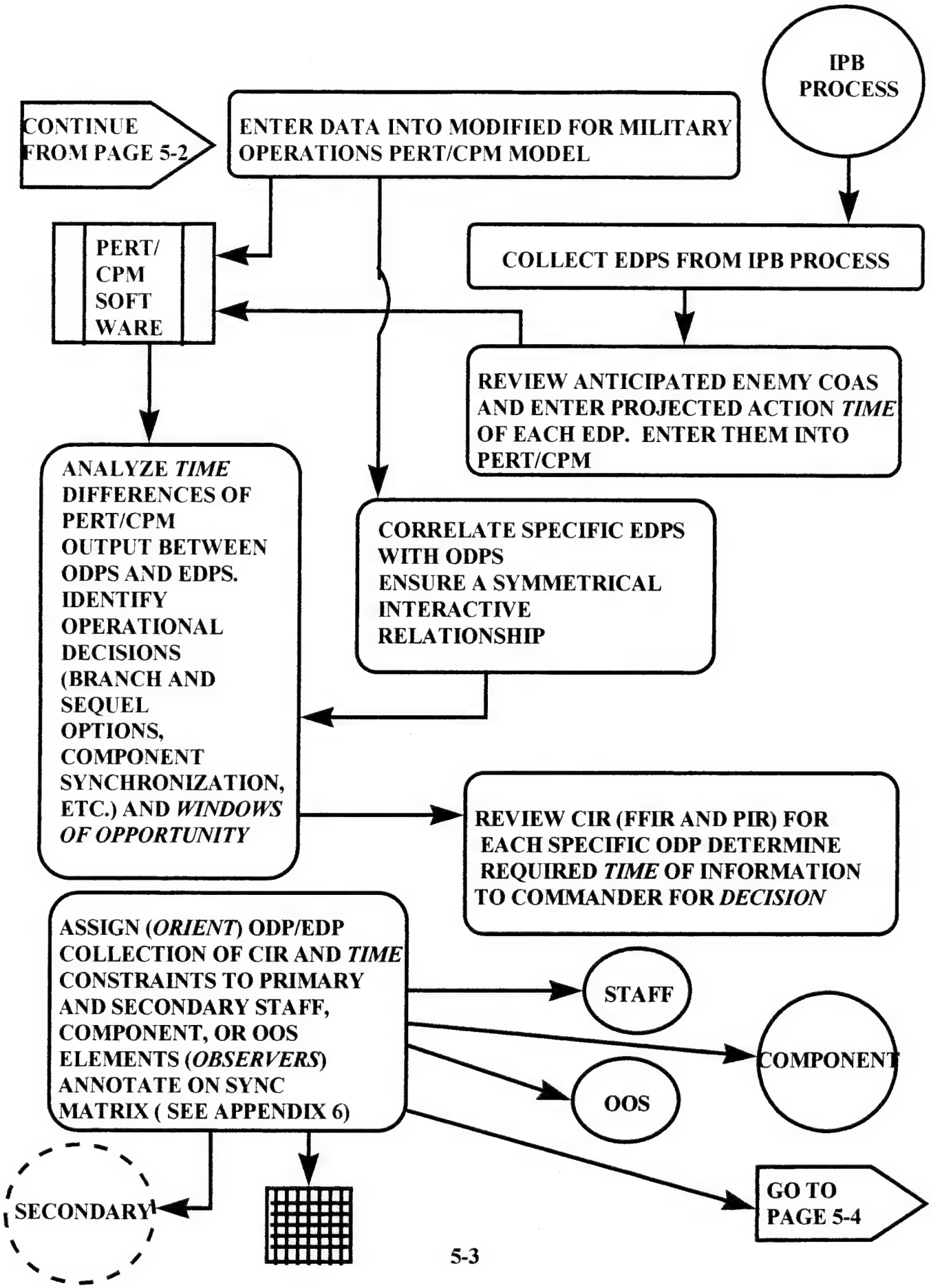
direction. The action consumes enemy operational options, limits his choices, and shapes the battlespace for dominance in favor of the operational commander.

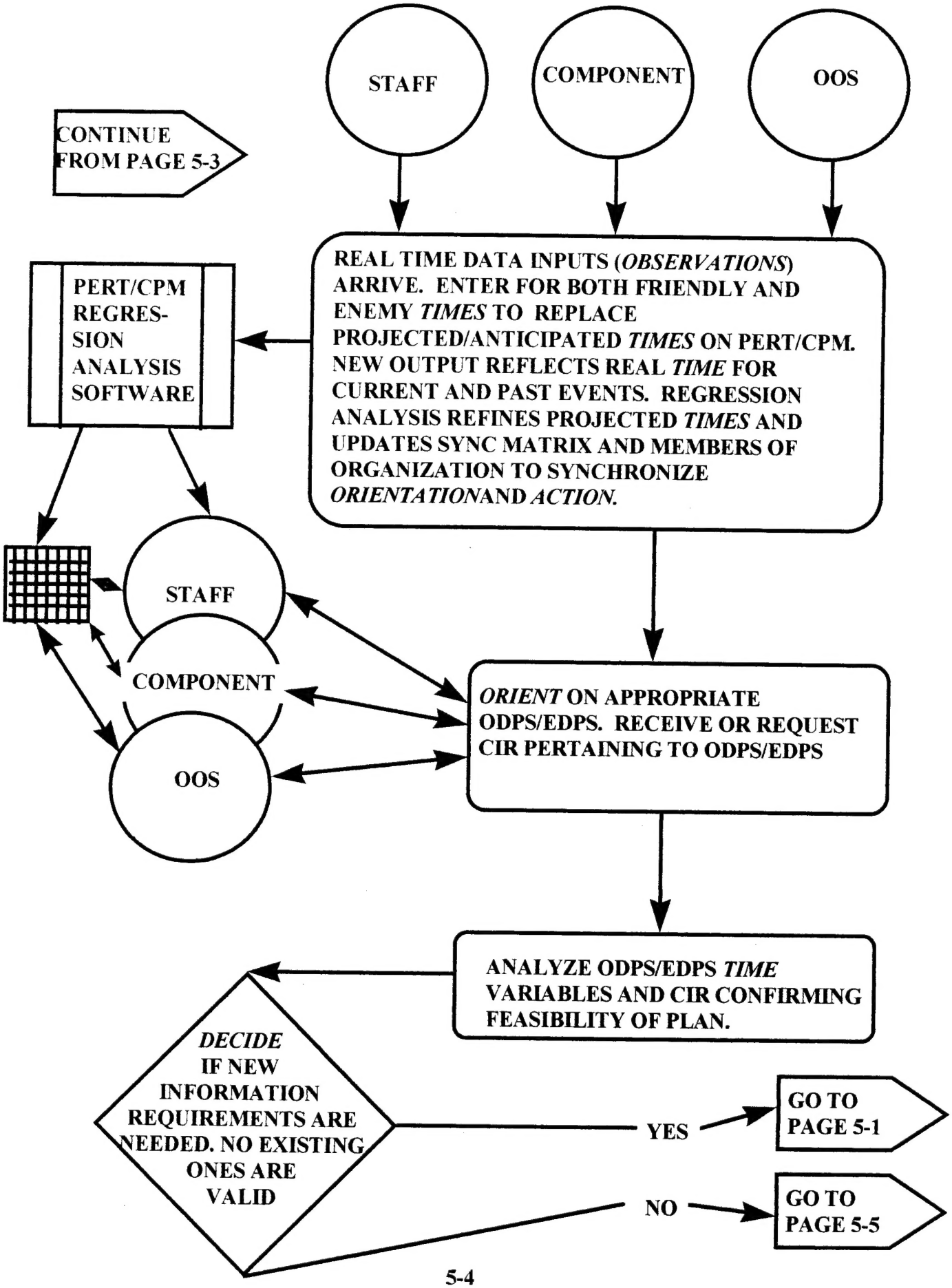
The medium of the execution decision model is time. PERT/CPM techniques apply time as a means of visualizing the operation in its totality. PERT captures the projection of favorable and unfavorable activities using time. The operational commander decision making projects into the future using time. Therefore PERT/CPM techniques are a viable tool for the execution decision model. Coupled with the purpose of the ODP, the force or resource required to achieve the desired affect, and time the operational commander can make rapid accurate decisions during execution.

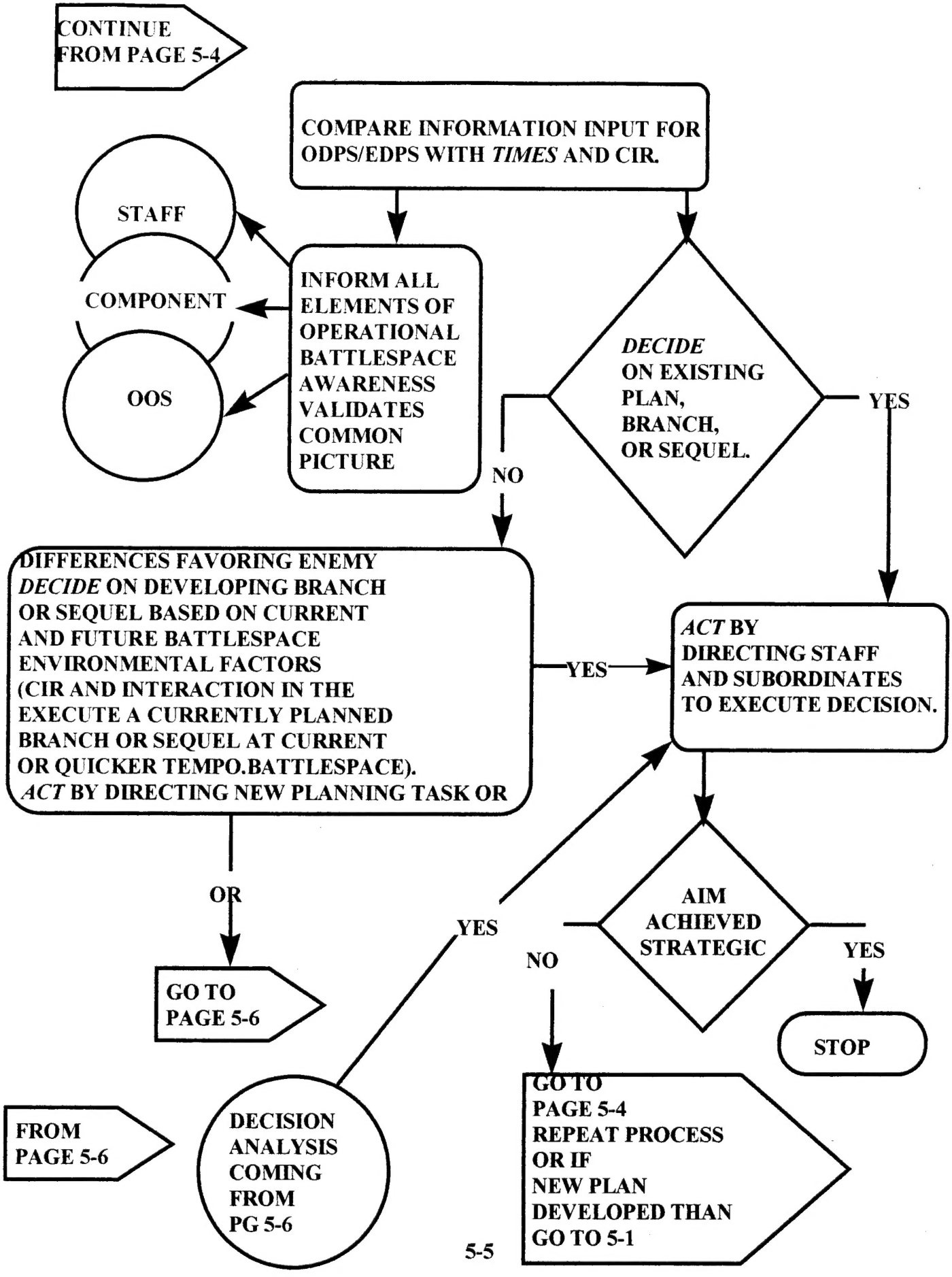
APPENDIX 5--FLOW CHART OF THE DECISION PROCESS DURING EXECUTION

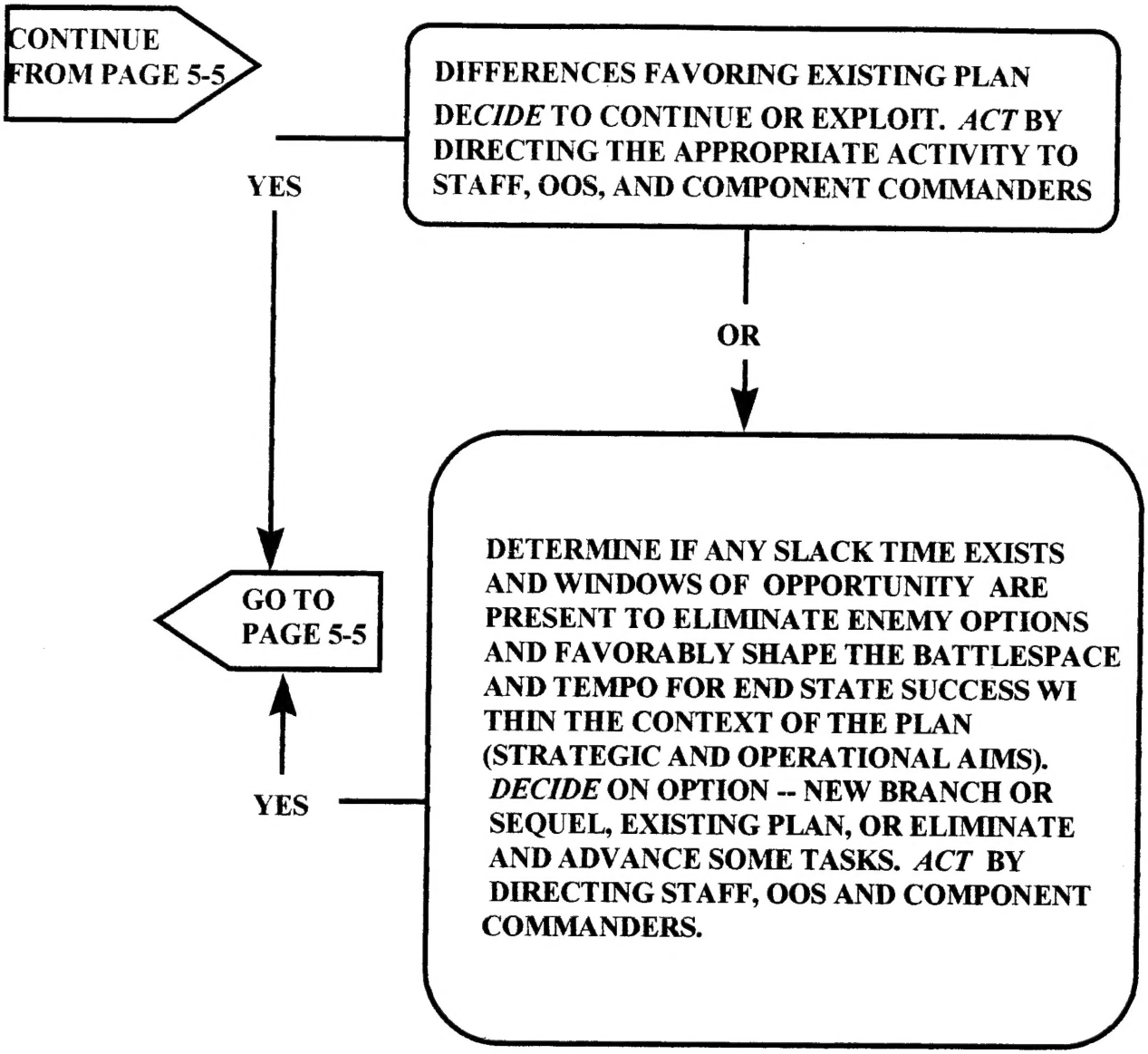



CONTINUE FROM PAGE 5-1
PRIORITIZE IMPORTANCE OF EACH INFORMATION REQUIREMENT RELATED SPECIFICALLY TO AN EDP FOR *ORIENTING* THE COLLECTION
INFORM ALL OOS, STAFF COMPONENTS
DETERMINE WHICH STAFF ELEMENT IS RESPONSIBLE FOR *OBSERVING* , PROCESSING AND COLLECTING THE INFORMATION
IDENTIFY BOTH PRIMARY AND SECONDARY INFORMATION SOURCE
ASSIGN TO THE APPROPIATE STAFF
ASSIGN TO THE APPROPIATE ACTION AGENCY
IDENTIFY A PRIMARY AND SECONDARY CONDUIT FOR INFORMATION FLOW
COMPONENT OR OOS LEADS CAN PROVIDE THESE
STAFF PROPONENT WILL DETERMINE DATA POINTS E.G. TYPE OF MOVEMENT ETC.
CONDUCT TIME ANALYSIS FOR OPERATIONAL-TACTICAL TASKS AND OPERATIONAL TASKS
GO TO PAGE 5-3


IPB PROCESS
CONTINUE FROM PAGE 5-2
ENTER DATA INTO MODIFIED FOR MILITARY OPERATIONS PERT/CPM MODEL
PERT/ CPM SOFT WARE
COLLECT EDPS FROM IPB PROCESS
REVIEW ANTICIPATED ENEMY COAS AND ENTER PROJECTED ACTION *TIME* OF EACH EDP. ENTER THEM INTO PERT/CPM
ANALYZE *TIME* DIFFERENCES OF PERT/CPM OUTPUT BETWEEN ODPS AND EDPS. IDENTIFY OPERATIONAL DECISIONS (BRANCH AND SEQUEL OPTIONS, COMPONENT SYNCHRONIZATION, ETC.) AND *WINDOWS OF OPPORTUNITY*
CORRELATE SPECIFIC EDPS WITH ODPS ENSURE A SYMMETRICAL INTERACTIVE RELATIONSHIP
REVIEW CIR (FFIR AND PIR) FOR EACH SPECIFIC ODP DETERMINE REQUIRED *TIME* OF INFORMATION TO COMMANDER FOR *DECISION*
ASSIGN (*ORIENT*) ODP/EDP COLLECTION OF CIR AND *TIME* CONSTRAINTS TO PRIMARY AND SECONDARY STAFF, COMPONENT, OR OOS ELEMENTS (*OBSERVERS*) ANNOTATE ON SYNC MATRIX (SEE APPENDIX 6)
STAFF
COMPONENT
OOS
SECONDARY
GO TO PAGE 5-4


STAFF
COMPONENT
OOS
CONTINUE FROM PAGE 5-3
REAL TIME DATA INPUTS (*OBSERVATIONS*) ARRIVE. ENTER FOR BOTH FRIENDLY AND ENEMY *TIMES* TO REPLACE PROJECTED/ANTICIPATED *TIMES* ON PERT/CPM. NEW OUTPUT REFLECTS REAL *TIME* FOR CURRENT AND PAST EVENTS. REGRESSION ANALYSIS REFINES PROJECTED *TIMES* AND UPDATES SYNC MATRIX AND MEMBERS OF ORGANIZATION TO SYNCHRONIZE *ORIENTATION*AND *ACTION.*
PERT/CPM REGRES-SION ANALYSIS SOFTWARE
STAFF
COMPONENT
OOS
ORIENT ON APPROPRIATE ODPS/EDPS. RECEIVE OR REQUEST CIR PERTAINING TO ODPS/EDPS
ANALYZE ODPS/EDPS *TIME* VARIABLES AND CIR CONFIRMING FEASIBILITY OF PLAN.
DECIDE IF NEW INFORMATION REQUIREMENTS ARE NEEDED. NO EXISTING ONES ARE VALID
YES
GO TO PAGE 5-1
NO
GO TO PAGE 5-5


CONTINUE FROM PAGE 5-4
COMPARE INFORMATION INPUT FOR ODPS/EDPS WITH *TIMES* AND CIR.
STAFF
COMPONENT
OOS
INFORM ALL ELEMENTS OF OPERATIONAL BATTLESPACE AWARENESS VALIDATES COMMON PICTURE
DECIDE ON EXISTING PLAN, BRANCH, OR SEQUEL.
YES
NO
DIFFERENCES FAVORING ENEMY *DECIDE* ON DEVELOPING BRANCH OR SEQUEL BASED ON CURRENT AND FUTURE BATTLESPACE ENVIRONMENTAL FACTORS (CIR AND INTERACTION IN THE EXECUTE A CURRENTLY PLANNED BRANCH OR SEQUEL AT CURRENT OR QUICKER TEMPO.BATTLESPACE). *ACT* BY DIRECTING NEW PLANNING TASK OR
YES
ACT BY DIRECTING STAFF AND SUBORDINATES TO EXECUTE DECISION.
OR
GO TO PAGE 5-6
AIM ACHIEVED STRATEGIC
YES
NO
STOP
FROM PAGE 5-6
DECISION ANALYSIS COMING FROM PG 5-6
GO TO PAGE 5-4 REPEAT PROCESS OR IF NEW PLAN DEVELOPED THAN GO TO 5-1


CONTINUE FROM PAGE 5-5
DIFFERENCES FAVORING EXISTING PLAN
DECIDE TO CONTINUE OR EXPLOIT. ACT BY DIRECTING THE APPROPRIATE ACTIVITY TO STAFF, OOS, AND COMPONENT COMMANDERS
YES
OR
DETERMINE IF ANY SLACK TIME EXISTS AND WINDOWS OF OPPORTUNITY ARE PRESENT TO ELIMINATE ENEMY OPTIONS AND FAVORABLY SHAPE THE BATTLESPACE AND TEMPO FOR END STATE SUCCESS WI THIN THE CONTEXT OF THE PLAN (STRATEGIC AND OPERATIONAL AIMS). DECIDE ON OPTION -- NEW BRANCH OR SEQUEL, EXISTING PLAN, OR ELIMINATE AND ADVANCE SOME TASKS. ACT BY DIRECTING STAFF, OOS AND COMPONENT COMMANDERS.
GO TO PAGE 5-5
YES

PROPOSED OPERATIONAL SYNCHRONIZATION MATRIX

EDP								
ODP								
CIR/TIME								
INTEL								
MOVE MANEUVER								
FIRES								
PROTECT								
C2								
SUPT								